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Potato Gene Resources

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International Treaty on Plant Genetic Resources for Food and Agriculture

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Plant genetic resources for food and agriculture are crucial in feeding the world's population. They are the raw material that farmers and plant breeders use to improve the quality and productivity of our crops. They also include current and obsolete cultivars, landraces, farmer's varieties and wild crop relatives. The future of agriculture depends on international cooperation and on the open exchange of the crops and their genes that farmers all over the world have developed and exchanged. No country is sufficient in itself. All depend on crops and the genetic diversity within these crops from other countries. International cooperation and open exchange of genetic resources are therefore essential for food security. The fair sharing of benefits arising from the use of these resources has, for the first time, been practically implemented at the international level through the Treaty and its Standard Material Transfer Agreement.

After seven years of negotiations, the FAO Conference adopted the Treaty in November 2001. This legally-binding Treaty, which came into force on June 29, 2004, covers all plant genetic resources and is in harmony with the Convention on Biological Diversity. The Treaty is vital in ensuring the continued availability of plant genetic resources that countries will need to feed their people. We must conserve for future generations the genetic diversity essential for food and agriculture. The objectives of the Treaty are the conservation and sustainable use of plant genetic resources for food and agriculture and the fair and equitable sharing of benefits derived from their use for sustainable agriculture and food security.

Through the Treaty, countries agreed to establish an efficient, effective and transparent Multilateral System to facilitate access to plant genetic resources, and to share the benefits in a fair and equitable way. The Multilateral System applies to over 64 major crops and forages which supply about 80% of our food. The Governing Body of the Treaty, which is composed of the countries that have ratified the Treaty, set out the conditions for access and benefit-sharing in a "Standard Material Transfer Agreement".

Resources may be obtained from the Multilateral System through mutually agreed terms for utilization and conservation in research, breeding and training, provided that such purpose does not include chemical, pharmaceutical and/or other non-food/feed industrial uses. When a commercial product is developed using these resources, the Treaty provides for payment of an equitable

share of the resulting monetary benefits, if this product may not be used without restriction by others for further research and breeding. If others may use it, payment is voluntary.

The Treaty provides for sharing the benefits of using plant genetic resources through information-exchange, access to and the transfer of technology and capacity-building. It also foresees a funding strategy to mobilize funds for activities, plans and programmes to help, above all, small farmers in developing countries. This funding strategy also includes the share of the monetary benefits paid under the Multilateral System.

The Treaty recognizes the enormous contribution farmers and their communities have made and continue to make to the conservation and development of plant genetic resources. This is the basis for Farmers' Rights, which include the protection of traditional knowledge, and the right to participate equitably in benefit-sharing and in national decision-making about plant genetic resources. It gives governments the responsibility for implementing these rights.

Many entities benefit from the Treaty, for example: farmers and their communities, through Farmers' Rights; consumers, because of a greater variety of foods and agriculture products, as well as increased food security; the scientific community, through access to the plant genetic resources crucial for research and plant breeding; the International Agricultural Research Centres, whose collections the Treaty puts on a safe and long-term legal footing; the public and private sectors, which are assured access to a wide range of genetic diversity for agricultural development; and the environment and future generations, because the Treaty will help conserve the genetic diversity necessary to face unpredictable environmental changes and future human needs.

Molecular Characterization of the Potato Clones at the Potato Gene Resources Repository

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The Potato Gene Resources Repository was established in 1992 at the Potato Research Centre of Agriculture and Agri-Food Canada, Fredericton, New Brunswick, to maintain potato clones of value and interest to Canada. Over the years of research effort, the Repository has grown to 132 clones, of which 119 are maintained *in vitro* and 13 as tubers. These clones have been widely utilized in Canadian potato breeding programs to create new and improved varieties, with increased disease and pest resistance and other desirable traits.

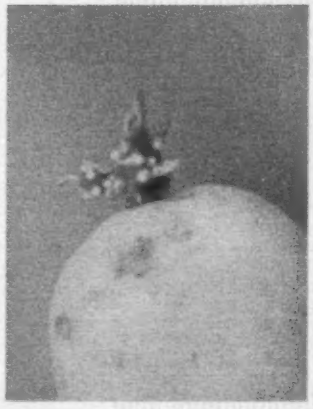
To enhance potato breeding programs and conserve the potato germplasm released from the Canadian potato breeding programs, a molecular characterization of the 132 Repository potato clones and 37 potato accessions recruited for the study was made during 2007-2008 with advanced molecular technology called simple sequence repeat (SSR) markers. The characterization not only generated a complete DNA fingerprint of all the potato clones maintained at the Repository, but also allowed for the detailed assessment of the genetic diversity, genetic structure, genetic association and genetic distinctiveness of the potato accessions. The collaborative research findings were published in detail in a recent issue of the American Journal of Potato Research (volume 86 (2009), issue 1, page 38-48).

One of the major findings is the extremely low genetic diversity harbored in these potato accessions. For example, the proportion of total SSR variation occurring between Canadian and exotic germplasm was 0.6%; among the Canadian cultivars released over four major breeding periods

2.7%; among heirloom varieties, modern cultivars and elite breeding lines 4%; and between tetraploid and diploid lines 3.7%. Slightly more diversity was found for exotic, than the Canadian, germplasm. The modern cultivars displayed slightly more diversity than the heirloom varieties and the early cultivars revealed slightly more variation than the recent ones. However, limited diversity and differentiation should be not surprising for several reasons. First, only a small number of introduction events formed the basis of modern potato germplasm. Second, the USA cultivar Katahdin is responsible for almost a quarter of the germplasm that makes up prominent North American cultivars. Third, the Canadian potato breeding has long been limited to a narrow genetic base with fewer introgressions of new exotic germplasm. Recent efforts to incorporate germplasm from Andean cultivated species into some Canadian cultivars yielded an improvement only in the level of genetic relatedness, but not in the magnitude of genetic diversity.

Another interesting finding is the close genetic relatedness among these potato clones, as illustrated in Figure 2 of the publication for all the 169 potato accessions characterized in this study. Based on their genetic similarities, these accessions could roughly be clustered into more than 10 groups, but the groups were not distantly separated. The clustering also helped to reveal several groups of highly related (or genetically duplicated) accessions. The good examples are the modern cultivar pairs of Canso vs Canus; Rose Gold vs Red Gold; and the elite line pair of LRC 373-5 vs LRC 4373-5b, which is expected from the known pedigrees. The other group consisted of the blue-fleshed clones Sharon's Blue, River John Blue, Nova Scotia Blue, MacIntosh Black, Congo, British Columbia Blue, and McIntyre Blue. The genetic relatedness is more obvious for the group of fingerlings: Banana, Kifli, Corne de Mouton, Jogeva Yellow Estonian, and Fingerling. These results are very informative to tracing the history of some heirloom varieties.

Flower of Canus – AD 0.247



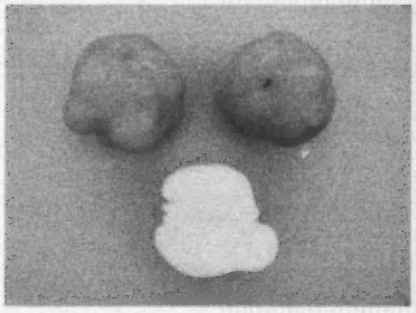
Sprout of Canus – AD 0.247

The analysis also generated a list of genetically distinctive potato clones as illustrated in Table 4 of the publication. The line NRBK-05 recruited from Germany had the most genetically distinctive background, followed by the Canadian clones LRC 4373-5b and LRC 373-5. The 31 genetically most distinctive accessions contains a diverse group of four diploid accessions, 16 elite lines, 10 heirloom varieties and five modern cultivars. In contrast, among the 31 genetically least distinctive accessions, there were no diploid accessions, one elite line, eight heirloom varieties, and 22 modern cultivars. This contrast clearly demonstrates the low level of genetic distinctiveness in modern cultivars.

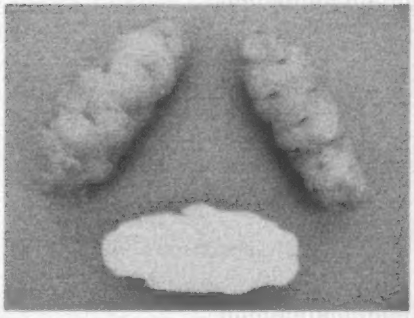
Flower of Crotte D'Ours – AD 0.307

Sprout of Crotte D'Ours – AD 0.307

Clearly, this SSR analysis revealed a narrow genetic base for Canadian potato cultivars generally and specifically for the germplasm held in the Canadian Potato Gene Resources Repository. Although the mandate of the Repository focuses more on the Canadian potato germplasm, more efforts to expand the diversity range of the potato collection are warranted with targeted acquisitions of potato germplasm from countries with temperate climates similar to that of Canada. The characterization data presented here are useful for managing the existing potato germplasm in germplasm addition, accession identification, duplication verification, and germplasm structuring. Also, the analysis showed that Canadian potato germplasm harbored less SSR variation than those accessions from the other seven countries. This narrow genetic base persists in spite of the use in breeding of Andean cultivated potatoes of groups Phureja, Andigena and Tuberosum and as many as 14 wild species. Canadian breeders have worked with germplasm from the Phureja and Andigena Groups and have released disease resistant germplasm. However, continuing efforts are still needed to diversify the Canadian potato gene pool to ensure sustainable breeding programs in the future. The related findings on genetic association and distinctiveness are helpful for parental selection of diverse plants for potato breeding. Overall, the molecular characterization of potato germplasm generated not only essential information for managing the potato collection, but also provided a useful guide for selecting specific germplasm with distinct genetic background for diversifying potato breeding program.



Black Mignion – The Cup – AD 0.296



Haida – AD 0.296

Table 4. One hundred and sixty-nine potato accessions ranked with the highest (left) to lowest (right) values of average dissimilarity (AD)

Accession[a]	AD	CN[b]	Accession[a]	AD	CN[b]
NRBK-05 GB.E	0.353	105502	Pink Pearl CA.M	0.241	105514
LRC 4373-5b CA.E	0.346	105561	Envol CA.M	0.242	NG
LRC 373-5 CA.E (2x)	0.344	105560	Manota US.H	0.246	105491
13594-070 CA.E (2x)	0.342	NG	Canus US.M	0.247	105457
Siberian CA.H	0.337	105529	OAC Ruby Gold CA.M	0.250	105544
NRBK-09 GB.E	0.324	105506	Brise Du Nord CA.M	0.251	NG
NRBK-10 GB.E	0.316	105507	Canso CA.M	0.252	105456
Mrs. Mochrle's Yellow Fleshed CA.H	0.315	105495	Jemseg CA.M	0.252	105483
Carlton CA.M	0.311	105460	Myatt's Ashleaf GB.H	0.252	105497
Lenape US.M	0.310	105487	OAC Temagami CA.M	0.254	105545
75-10 CA.E (2x)	0.309	NG	Russet Burbank US.H	0.254	105562
Crotte D'Ours CA.H	0.307	105465	White Rural New Yorker US.H	0.254	105536
NRBK-04 NL.E	0.304	105501	Pacific Russet CA.M	0.254	NG
NRBK-07 GB.E	0.301	105504	AC Belmont CA.M	0.255	105434
USDA X96-56 US.E	0.299	105541	Eramosa CA.M	0.256	105469
Candy Cane CA.E (2x)	0.297	105455	Royal Kidney GB.H	0.256	105523
A13917-04 CA.E	0.297	NG	Prospect CA.M	0.256	NG
Black Mignion CA.H	0.296	105550	F58050 CA.E	0.257	105470
Haida CA.H	0.296	105479	Rambling Rose CA.H	0.258	105516
A12044-55 CA.E	0.295	NG	Bijou Red CA.M	0.258	NG
A13655-21 CA.E	0.295	NG	AC Ouelle CA.M	0.259	NG
Anson CA.M	0.294	105444	Cain's Irish Rocks CA.H	0.259	105509
Yam GB.H	0.293	105537	Nipigon CA.M	0.259	105453
Blue Mac CA.M	0.292	105449	Abnaki US.M	0.260	105441
Blue Shetland CA.H	0.292	105450	AC Novachip CA.M	0.260	105439
F 79070 CA.E	0.292	105473	Acadia Russet CA.M	0.260	105442
Bliss Triumph US.H	0.292	105552	Brigus CA.M	0.260	105451
Simcoe CA.M	0.291	105530	Columbia Russet CA.H	0.260	NG
Straight Banana CA.H	0.291	105533	Kennebec US.M	0.261	NG
NRBK-01 NL.E	0.290	105498	Shepody CA.M	0.261	105528
Pink Fir Apple GB.H	0.290	105513	AC Chaleur CA.M	0.262	105437
Batoche CA.M	0.289	105447	Green Mountain US.H	0.262	105478
NRBK-06 GB.E	0.289	105503	Houma US.H	0.262	105548
Keswick CA.M	0.288	105485	Katahdin US.H	0.262	NG
Nova Scotia Blue CA.H	0.288	105512	Gold Coin US.H	0.262	105555
Belleisle CA.M	0.287	105448	Rideau CA.M	0.263	105520
Cherokee US.M	0.287	NG	Abeille CA.M	0.264	NG
Trent CA.M	0.287	105535	AC Brador CA.M	0.264	105436
9970-02 CA.E	0.287	NG	Beauty of Hebron US.H	0.264	105551
AC Blue Pride CA.M	0.286	105435	Fjord CA.M	0.264	NG
Skerry Blue GB.H	0.286	105531	Purple Chief CA.H	0.264	105515
Peribonka CA.M	0.286	NG	Richter's Jubel DE.H	0.264	105519
NRBK-03 NL.E	0.285	105500	York CA.M	0.264	105538
Raritan CA.M	0.284	105517	White Rose US.H	0.265	105557
Donna CA.M	0.283	105467	AC Peregrine Red CA.M	0.266	NG
Libertas NL.M	0.283	105488	Désirée NL.M	0.266	NG

(Continued on next page)

Table 4. One hundred and sixty-nine potato accessions ranked with the highest (left) to lowest (right) values of average dissimilarity (AD)

Accession[a]	AD	CN[b]	Accession[a]	AD	CN[b]
Macintosh Black CA.H	0.283	105490	Earlaine US.H	0.266	105553
Dorita NL.M	0.282	105468	Mcintyre Blue CA.H	0.266	105493
Hindenburg DE.H	0.282	105480	Niska US.M	0.266	105510
Red Gold CA.M	0.282	105518	Yellow Fin US.H	0.266	105557
Rose Gold CA.M	0.282	105522	Fingerling GB.H	0.267	105474
AC Stampede Russet CA.M	0.282	NG	Huron CA.M	0.268	105482
AC Red Island CA.M	0.281	105440	K113-1 US.E	0.268	105484
F66041 CA.E	0.281	105471	Red Warba US.H	0.268	105556
Marc Warshaw's Quebec CA.H	0.281	105492	Up-to-date GB.H	0.268	105563
River John Blue CA.H	0.281	105521	W5337.3 CA.E	0.268	NG
A13427-02 CA.E	0.281	NG	Yukon Gold CA.M	0.268	105539
Epicure GB.H	0.281	105559	Banana CA.H	0.270	105446
Corne de Mouton CA.H	0.280	105464	Conestoga CA.M	0.270	105462
Grand Falls CA.M	0.280	105477	Hunter CA.M	0.270	105481
Lumpers GB.H	0.280	105489	Northern White CA.H	0.270	105511
Island Sunshine CA.M	0.280	NG	USDA 41956 US.E	0.270	105540
11827-09 CA.E	0.280	NG	AC Ptarmigan CA.M	0.271	NG
British Columbia Blue CA.H	0.279	105452	Cariboo CA.M	0.271	105459
Chinook CA.M	0.279	105461	Congo SE.H	0.271	105463
F87084 CA.E	0.279	105542	Fortyfold GB.H	0.271	105475
Mirton Pearl CA.M	0.279	105494	Garnet Chili US.H	0.271	105547
A11542_07 CA.E	0.279	NG	NRBK-08 GB.E	0.271	105505
Caribe CA.M	0.278	105458	Saginaw Gold CA.M	0.271	105526
F79055 CA.E	0.278	105472	Altitude CA.M	0.272	NG
NRBK-02 NL.E	0.278	105499	Roselys CA.M	0.272	NG
Sharon's Blue CA.H	0.278	105527	Sable CA.M	0.272	105525
Aquilon CA.M	0.278	NG	AC Pocat CA.M	0.273	NG
Avon CA.M	0.277	105445	Calico CA.H	0.273	105454
Mouraska CA.M	0.277	105496	Early Rose US.H	0.273	105554
NRBK-11GB.E	0.277	105508	Fundy CA.M	0.273	105476
11364-04 CA.E	0.277	NG	Ruby Pulsiver's Bluenoser CA.H	0.273	105524
9787-07 CA.E	0.277	NG	Cupids CA.M	0.274	105466
AC Domino CA.M	0.276	105438	La Veine Rose CA.H	0.274	105486
AC Sunbury CA.M	0.276	105549	Slovenian Crescent SI.H	0.274	105532
Angelina Mahoney's Blue CA.H	0.275	105443	Tobique CA.M	0.274	105534
Jogeva Yellow Estonian CA.H	0.275	105566	Urgenta NL.M	0.274	105564
Kifli AT.H	0.275	105565	12060-14 CA.E	0.275	NG
OAC Royal Gold CA.M	0.275	105543	AC Maple Gold CA.M	0.275	NG
AC Glacier Chip CA.M	0.275	NG			

[a] Accession label includes accession name, followed by ISO two-letter code for country origin, germplasm type (H=heirloom variety, M=modern cultivar, and E=elite line), and diploid in parenthesis (if applicable).

[b] CN=the Canadian National accession number in germplasm collections held at Plant Gene Resources of Canada (PGRC); NG=newly recruited germplasm accessions that are not part of the PGRC collection.

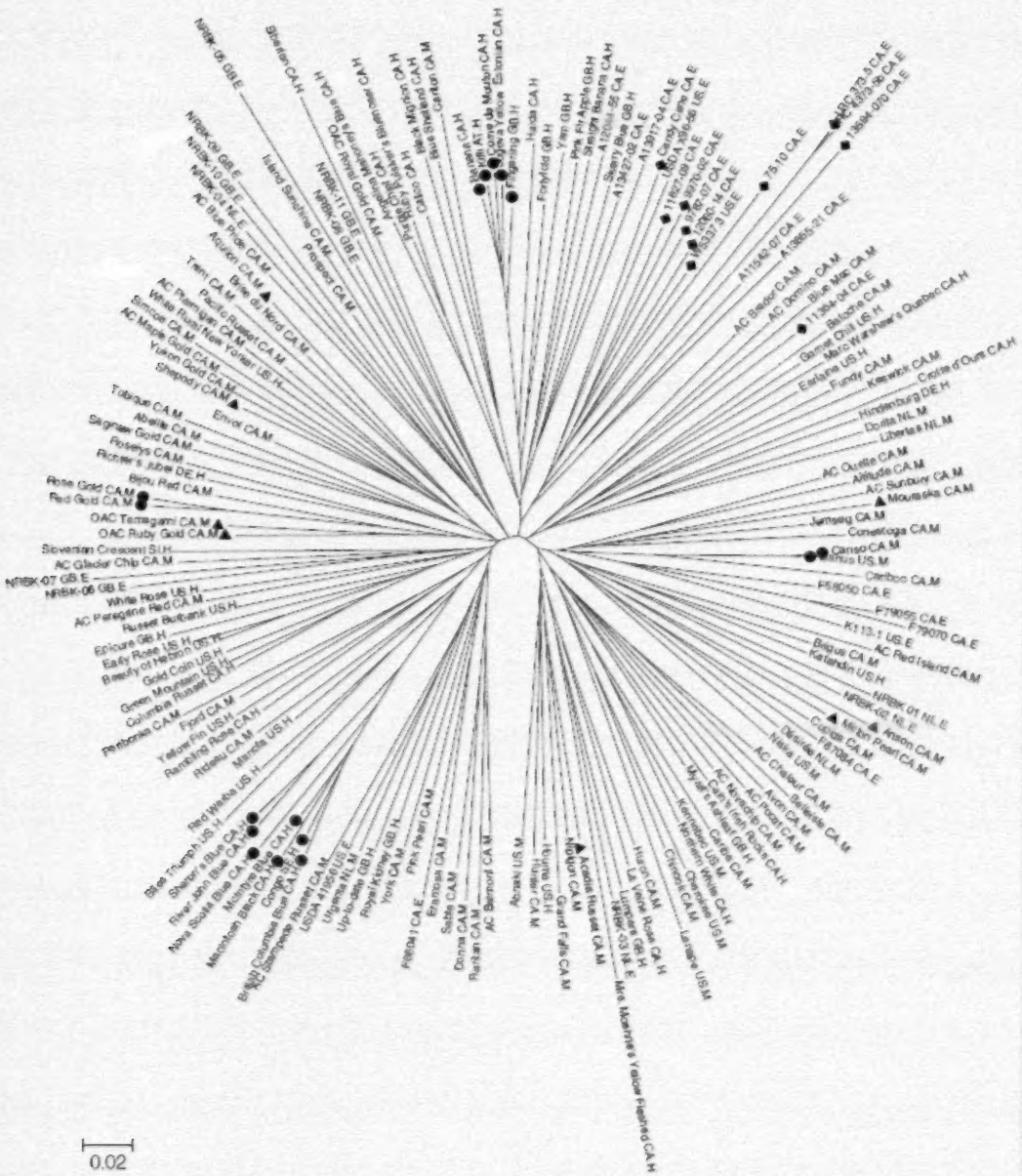


Fig. 2 Clustering of 169 potato accessions obtained from the neighbor-joining analysis of 232 SSR alleles. Accession label includes the accession name, followed by ISO two-letter code for its country origin and one letter code for its germplasm type (*H* heirloom variety; *M* modern cultivar; *E* elite line). Diploid accessions are marked with black diamonds; examples of highly related (or genetically duplicated) accessions with black circles, except the genetically distinct pair of LRC 373-5 and LRC 4373-5b; and examples of congruent or incongruent accessions with respect to known pedigree with black triangles

References

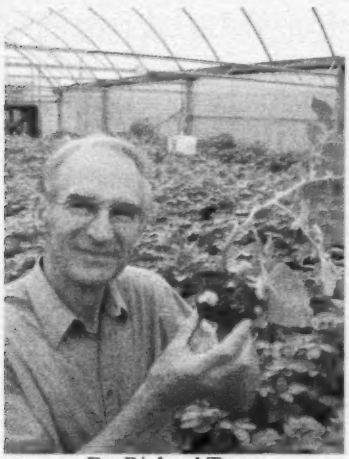
Fu, Y.B., G.W. Peterson, K.W. Richards, T.R. Tarn and J.E. Percy. 2009. Genetic Diversity of Canadian and Exotic Potato Germplasm Revealed by Simple Sequence Repeat Markers. American Journal of Potato Research 86: 38-48.

To obtain a copy of this paper, please contact Dr. Yong-Bi Fu, Plant Gene Resources of Canada, Saskatoon Research Centre, Agriculture and Agri-Food Canada, 107 Science Place, Saskatoon, SK, Canada S7N 0X2 e-mail: yong-bi.fu@agr.gc.ca.

Dr. Richard Tarn: A Retrospective

Agnes Murphy, Research Scientist,
Potato Research Centre, AAFC,
Fredericton, NB

Dr. T. Richard Tarn retired from AAFC's Potato Research Centre at the end of October after a 40-year career in potato breeding at Fredericton.



Dr. Richard Tarn

Richard joined the breeding program in 1968 following completion of a PhD in Plant Botany at the University of Birmingham in the UK. It was at Birmingham, as a summer student with Professor Jack Hawkes, that Richard first developed an interest in potatoes. Working with the eminent taxonomist, he grew out Solanum species in the greenhouse and proof read potato species descriptions and identification keys, honing his taxonomic skills in the process. Richard had planned to become a teacher but Hawkes convinced him to study taxonomy. His thesis focused on the origins of ploidy levels in wild species.

Following graduation, Richard received support from the Rockerfeller Foundation to travel and collect specimens in Mexico under the direction of Dr. John Neiderhauser. Some of these materials returned to Birmingham while others remained in Mexico. Richard emigrated to Canada in 1968 to accept a position as research scientist at Fredericton. He met his wife, Jane, in the city and they continue to live in the community after his retirement.

From 1986 to 2002 Richard led the Potato Breeding Study at Fredericton and went on to lead a national program on Potato Breeding and Genetic Enhancement from 2002 to 2008. During this time, Dr.Tarn contributed to the development and release of many cultivars, most notably Shepody, grown widely in North America and Europe for French fry production. Another cultivar, Rochdale Gold- Dorée was released exclusively to Co-op Atlantic in 2004. It was the first example of a Canadian cultivar to be produced and marketed by a retail operation. And, since the inception of the AAFC Accelerated Release Program for potatoes in 1998, more than 75 selections have been released for industry evaluation under his direction. About a dozen of these have been considered for licence agreements.

Along with the management of cultivar development at Fredericton, Richard conducted research to increase genetic diversity via the introduction and adaptation of Andigena germplasm. These materials have contributed yield potential and disease resistance. A concerted effort to increase the frequency of specific disease resistance

traits over several breeding cycles spanning 30 years has resulted in a collection of parents with resistance to multiple diseases.

Richard also maintained an interest in germplasm collection and speaks fondly of his participation in three expeditions in Mexico in the early 1980's.

Solanum bulbocastanum photographed in Mexico by Richard Tarn, 1984

These exciting trips, organized under the auspices of the USDA Potato Introduction Project, were especially fruitful because several species were collected for the first time. Contacts forged with scientists at the USDA Potato Introduction Genebank at Sturgeon Bay, Wisconsin during these expeditions were long lasting. Richard went on to serve on the technical committee of the US gene bank for more than 25 years.

Richard credits Jack Hawkes for instilling in him the value of genetic diversity and the importance of preserving germplasm resources. They kept in touch over the years until Hawke's death several years ago. The Canadian Potato Gene Resources Repository is a demonstrable example of this longstanding commitment to germplasm preservation. Tarn was instrumental in obtaining support for its establishment in 1994 through Green Plan funding. With his colleague, Dr. Jane Seabrook, a convincing case was made to preserve Canadian-bred cultivars, heritage cultivars and research materials *in vitro*. Eventually, the collection became the potato node in the national project #31 for plant gene resources preservation for all crops, managed by Dr. Ken Richards at AAFC, Saskatoon.

Quality evaluation of potato clones: Denise LeBlanc, Richard Tarn, Karen Davidge, and Loretta Mikitzell

Richard was quick to note the role of technician, Jane Percy. He elaborated this way: "Jane has been associated with the collection from the beginning. Her thorough approach and care has ensured the integrity of the collection and the data base. What's more, she has often been the public face for the collection. She has displayed samples from the collection at numerous trade shows and fairs and has a particular knack for interacting with the public. And of course, she produces the annual newsletter." Today, the collection is the go-to source for Canadian-bred cultivars and heirloom cultivars no longer available commercially as well as for genetic resources for research and development.

Richard went on to say "My involvement with the repository has given me the opportunity to meet all sorts of keen potato people such as Garrett Pittenger of Seeds of Diversity. His drive to preserve heritage cultivars is remarkable. A meal of fingerlings with him is a pleasant memory. I also recall conversations with George Brinson, Karen Davidge and Will Bonsall from Maine; their enthusiasm for heirloom cultivars is contagious."

Potato clones photographed by Richard Tarn

Richard's influence has extended nationally and internationally. He held executive positions with the Potato Association of America and has traveled extensively to deliver scientific papers and to provide advice. While potato breeding was the focus of his career, he also contributed to his community through leadership in groups that brought theatrical and musical events to Fredericton. As a founding member and director of the Fredericton Botanic Garden Association, he contributed many volunteer hours to the establishment and development of a botanic garden next to Odell Park. And when prompted he says, with pleasure, "Both my daughters and their families grow potatoes in their gardens".

Annual Report 2008

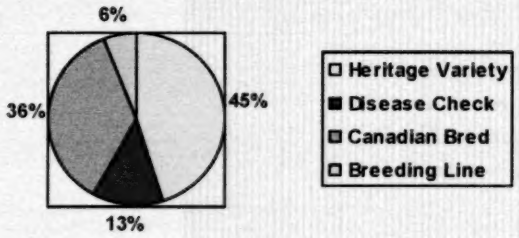
Potato Gene Resources Repository

Jane Percy

The Collection

1. Holdings

• The Potato Gene Resources Repository contains 151 clones. Of this total; 141 are maintained *in vitro* and 10 as tubers. A full listing of accessions may be found on the attached request form. The following chart shows the percentage of clones in each Repository category.



2. Accessions

• Eleven *in vitro* clones were added to the Repository in 2008. The new accessions include Austrian Crescent, Bauer Grün Rote Auge, Elmer's Blue, Matsuyama, Six Weeks, Belle-de-Fontenay, Kerr's Pink, La Ratte, Peanut, Purple Peruvian and Rose Fin Apple. These clones were obtained as part of the MII agreement with Seeds of Diversity Canada and Plant Gene Resources of Canada.

Austrian Crescent – A fingerling variety from the collection of Garrett Pittenger, Seeds of Diversity Canada, Austrian Crescent was returned from virus freeing this year. Garrett obtained the variety from Alex Caron of Ontario and has noted that Austrian Crescent is a larger fingerling than Kifli.[1]

Bauer Grün Rote Auge - Also known as Farmer Green's Red Eye, Garrett Pittenger obtained this clone from Ron Shaw. Garrett states that Bauer Grün Rote Auge is a long yellow-fleshed potato with light tan skin and pink- red eyes. It has drier flesh than many, and exhibits good baking and frying quality.[1]

Belle-de-Fontenay – Originating in France about 1885 and of unknown parentage, this variety is well known for its fine taste and waxy texture. It is a fingerling type with yellow skin and flesh. It is good when boiled for potato salad. An extensive description may be found on The European Cultivated Potato Database at http://www.europotato.org.[2] Obtained from the Maine Seed Potato Board.

Elmer's Blue – Recently returned from virus freeing, Elmer's Blue was donated by Garrett Pittenger, who obtained it from the collection of Elmer Hansen. Garrett describes Elmer's Blue as having deep purple skin and very high dry matter purple flesh. The plants have a lot of purple pigment in the leaves and stems and set seed balls prolifically.[1]

Kerr's Pink – Originating as the result of a cross made by James Henry in England between Fortyfold and Smith's Early in 1907, Kerr's Pink was originally named Henry's Seedling. A Mr. Kerr recognized it's potential, bought all the seed and renamed it Kerr's Pink in 1917. It was an extremely successful variety beginning in the early years after the First World War and for the next fifty years in the UK. It is classified as main crop - late and produces well on all soil types. It has a round tuber type, with part pink skin and cream coloured flesh. Cooking quality is described as good and texture as floury. Kerr's Pink remains popular today in Ireland and Scotland and is often harvested early, as a new potato.[3] Obtained from the Maine Seed Potato Board.

La Ratte – The parentage of this c.1872 fingerling heirloom from France is unknown. It is described as having an excellent cooking quality when boiled and a distinctive chestnut flavour. The skin is parchment coloured and the flesh is yellow.[3] Obtained from the Maine Seed Potato Board.

Matsuyama – Also donated by Garrett Pittenger, and recently returned from virus freeing, Matsuyama, is oblong and flat with light pink skin and white flesh. Garrett described it as productive and the tubers as very good as an early potato.[1]

Peanut – Also known as Swedish Peanut and Mandel, this heirloom fingerling variety has tan netted skin, waxy dense, yellow flesh and a tear-drop shape. It is noted to store well and have high resistance to scab.[4] Obtained from the Maine Seed Potato Board.

Purple Peruvian – A very late season variety, Purple Peruvian has fingerling shaped tubers with purple skin and dry bright purple flesh.[4] Obtained from the Maine Seed Potato Board.

Rose Fin Apple – Genetic fingerprinting will be required to determine if this variety is distinct from Pink Fir Apple. It is a mid- to late-season fingerling variety with beige-rose skin and waxy bright yellow flesh. Secondary growth of knobs on the tubers is a feature in years with uneven soil moisture.[4] Obtained from the Maine Seed Potato Board.

Six Weeks – Betty Keeler of Vanscoy, SK, Canada donated this variety to the Repository and it has recently returned from virus freeing. Betty's family has safeguarded this variety for many years. The story of the three generations of the family, who grew the Six Weeks potato before her, appeared in the Seeds of Diversity Canada magazine Vol. 13 No. 1, January 2000, and is summarized here. Entitled "Mennonites and the Six Weeks Potato: A Memoir", the article traces the history and frequent migrations in search of religious freedom, of the Mennonite people. The Mennonites travelled from Switzerland in about1500, to the Netherlands, to West Prussia, where they then accepted an offer from Empress Catherine II of Russia to settle the vast steppes of South Russia along the shores of the Black Sea and the Sea of Azov. Catherine was aware of the strong work ethic and successful farming practices of the Mennonites. By 1835, 1200 families had made their home in the Molotchna colony where they introduced potatoes to this area of Russia. By 1884, as many as 18,000 had left for North America, with 8,000 settling in Manitoba. Betty Keeler's great grandmother, Katherine Thiessen, immigrated in 1890, at age 14, eventually settling in Springfield, SK, where Betty's grandmother, Maria, and mother, Anna were

raised. The history of the Six Weeks potato is closely intertwined with that of Betty's family. It is wonderful to know the provenance of an heirloom potato variety. Through their care over at least four generations, the family nurtured and saved the Six Weeks potato, making it possible for it to be entered into a virus freeing program by AAFC and banked in the Potato Gene Resources Repository for safekeeping.[5]

References

[1] Personal communication from Garrett Pittenger.
[2]The European Cultivated Potato Database http://www.europotato.org.
[3]Wilson, Alan, The Story of the Potato Through Illustrated Varieties, Balding & Mansell Ltd., Norfolk, UK, 1993.
[4]Washington State University Potato Information & Exchange – Potato Variety: A Comprehensive List http://potatoes.wsu.edu/varieties/.
[5] Mennonites and the Six Weeks Potato: A Memoir. Seeds of Diversity Canada magazine Vol. 13 No. 1, January 2000.

• No accessions were lost from the inventory in 2008.

3. Evaluations

• Ten varieties were grown in an evaluation trial at the Potato Research Centre. Two replications of fifteen hills of the following varieties Beauty of Hebron, Black Mignion, Bliss Triumph, Cherokee, Columbia Russet, Crotte d'Ours, Earlaine, Houma, Lenape, and Up-to-Date were grown. Superior and Chieftain were grown as checks. The tubers and tuber light sprouts were photographed by Cynthia Murray.

• Twenty-six clones were grown in 20 hill plots at the Benton Ridge Potato Breeding Substation, Benton, NB to provide material for demonstration and cooking quality throughout the winter and spring.

4. Management

• Passport data for all PGR accessions has been added to the Genetic Resources Information Network - Canadian Version (GRIN - CA). GRIN - CA may be accessed through the Plant Gene Resources of Canada web site http://pgrc3.agr.ca/.

• Disease testing of new *in vitro* accessions and clones which have been maintained *in vitro* for five years was completed. Thirty clones were grown in the greenhouse and tested twice in 2008. All clones were negative for PVA, PLRV, PotLV, PVS, PVX and PVY. Results for PSTV and BRR are pending. Extra minitubers from the greenhouse growout will be offered to PGR clients in the spring of 2009.

• *In vitro* clones were screened for bacterial and fungal contamination using Potato Dextrose Broth and Richardson's Broth, twice during 2008. All clones currently in the Repository were negative for these contaminants.

• Microtubers of PGR clones are stored at Plant Gene Resources of Canada in Saskatoon. The viability of the Repository is protected by this remote location, long-term storage arrangement. Dallas Kessler of Plant Gene Resources Canada, Saskatoon, SK continues to monitor and evaluate the microtubers. New microtubers are now being initiated to replace those currently stored in Saskatoon.

• A design for a secure lab and growth room for the Repository has been prepared and submitted.

5. Requests to the Repository

• Forty-eight requests for 555 were received in 2008. Of this number, 210 clones were *in vitro*, 310 clones were field grown tubers and 35 clones were greenhouse grown minitubers. The intended use of potato clones distributed in 2008 is tabulated below.

Purpose of Request	Request	Clones	*In Vitro*	Tubers	Mini-tubers	Micro-tubers
Breeding	1	1	1	-	-	-
Research	6	54	19	25	10	-
Demonstration	16	343	173	170	-	-
Evaluation	18	140	13	104	23	-
Preservation	5	15	2	11	2	-
Certification	2	2	2	-	-	-
Total	48	555	210	310	35	-

Five-Year Compilation of Clone Distribution for Potato Gene Resources 2004 -2009

Year	Total	Breeding, research, or certification requests	Heritage evaluation, demo, or preservation requests	Total clones distributed	Clones distributed as minitubers & tubers	Clones distributed *in vitro*	Micro-tubers distributed
2004	39	20	19	496	405	91	0
2005	54	18	36	654	364	183	107
2006	45	12	33	511	297	214	0
2007	49	15	34	552	220	210	122
2008	48	9	39	555	345	210	0
5-year total	235	74	161	2768	1631	908	229

• Angelina Mahoney's Blue and Haida were the most requested clones in 2008.

Number of Requests by Destination

Destination	Number of Requests
Newfoundland and Labrador	1
Prince Edward Island	1
Nova Scotia	2
New Brunswick	17
Quebec	10
Ontario	7
Alberta	1
British Columbia	1
USA	8
Total	48

Repository Items of Interest

Communication

• Fifty-five requests for information about the Repository, the availability of clones, clone descriptions and pedigrees, and techniques for handling *in vitro* material were received throughout the year.

• The annual Potato Gene Resources newsletter has a distribution of 375.

• Dagmar Baur wrote an article about the heritage varieties in the repository for edible Toronto, Winter 2008/2009 edition.

• The 2007 newsletter and several back issues may be accessed on the Weekly Checklist of Government of Canada Publications. Browse for the newsletter by title at http://publications.gc.ca/control/weeklyChecklistMain?searchAction=4&searchAction=13&productId=1

• An AAFC potato tabloid entitled "Canada's Buried Treasure" included an article on the Potato Gene Resources Repository.

Displays

• An AAFC exhibit in the Canadian Pavilion at the Festival of Lights in Charlottetown during the Canada Day weekend, showcased potato research and the International Year of the Potato. The Potato Research Centre's work on the health benefits of colored potatoes, including some varieties already in the marketplace and some numbered varieties that were released to industry by the Centre for further testing, were displayed. Heritage potato varieties and the work of the Potato Gene Repository to preserve potato genetic diversity were also highlighted. The related potato research that takes place at the AAFC Research Centre in Charlottetown and the United Nation's designation of 2008 as the International Year of the Potato were among the topics discussed with visitors to the exhibit.

New and interesting potato varieties displayed at the Festival of Lights, Charlottetown, PE. Photo by Wayne Riley, AAFC

• Richard Tarn spoke at the Toronto Potato Expo 2008, June 14th, 2008. This event, sponsored by the Peruvian Community Resource Centre, showcased yellow fleshed potatoes including Yukon Gold, other Repository clones and several diploid and tetraploid Andean clones.

• The landscape architecture installation "Pomme de Parterre: The Potato Speaks for Itself" was once again part of the International Garden Festival, Jardins de Métis, Grand-Métis, Québec. The repository provided disease free tubers of several heritage potato varieties to be planted at the installation and also tubers to be photographed for promotional material.

• Potato clones from the repository and the National Potato Breeding Program were featured as part of an AAFC and Government of Canada display at the Royal Agricultural Winter Fair held in Toronto from November 7-16, 2008. The International Year of the Potato was recognized and an AAFC potato poster showcasing Canadian-bred potatoes was displayed.

Visitors

• Visitors to the Repository in 2008 included Terry Brodie and Malcom Zwicker, staff members and, Susan Currie, summer student with the Plant Propagation Centre, NBDAA, Fredericton, NB; Laura Kennedy and Kelli Osborn, tv staff members of Frito-Lay, Rhinelander, WI, USA; and two journalism students from St. Thomas University, Fredericton, NB. The Potato Research Centre Open House in recognition of the UN International Year of the Potato saw many people come to the Centre to view research displays, field plots and other potato related activities, in early September 2008.

PRC Open House visitors enjoy a tractor ride past potato plots

Potato tubers dug for display at the PRC Open House

Potato Gene Resources Newsletter

The Potato Gene Resources Newsletter is an annual publication of the Potato Gene Resources Repository, Potato Research Centre, Agriculture and Agri-Food Canada.

The Newsletter provides information on potato germplasm in the Repository and on issues related to the genetic diversity in the potato. The opinions expressed by authors may not necessarily represent the views of Agriculture and Agri-Food Canada.

The Repository and the Seed Potato System

The Potato Gene Resources Repository provides *in vitro* plantlets and greenhouse or field tubers for breeding, research and heritage preservation. While extensively tested for freedom from disease, the plantlets and tubers distributed by the Potato Gene Resources Repository are produced outside the Canadian Seed Certification System and are not eligible for Certification.

The Canadian Seed Potato Certification System operates under the Seed Act and its Regulations. Certification begins with tested plantlets established *in vitro* in a facility accredited for this task by the Canadian Food Inspection Agency. The plantlets are used to produce greenhouse tubers which then go to the field in a limited generation system, at each step meeting strict standards specified in the Regulations. The Potato Gene Resources Repository is not accredited for seed production by the CFIA.

Potato Research Centre Website

http://www.agr.gc.ca/researchcentre/fredericton
offers an overview of the mandate, resources and achievements of the Centre. The research studies being conducted at the Centre as well as the staff associated with those studies are highlighted. Links to the Potato Research Network and to other agriculture and potato related websites are also available.

Plant Gene Resources of Canada

Canada's Plant Germplasm System is a network of Centres and people dedicated to preserving the genetic diversity of crop plants, their wild relatives and plants present and unique in the Canadian biodiversity. The system plays a significant part of Agriculture and Agri-Food Canada's commitment to the Canadian Biodiversity Strategy in response to the Convention on Biological Diversity.

The Plant Gene Resources of Canada (PGRC) website located at http://pgrc3.agr.ca/ includes information on PCRC and the multi-nodal system of germplasm conservation in Canada as well as opportunities to search for germplasm on the Genetic Resources Information Network-Canadian version (GRIN-CA). Dr. Ken Richards, Research Manager, Plant Gene Resources of Canada, may be contacted at Ken.Richards@agr.gc.ca

Personnel of the Potato Gene Resources Repository

Potato Research Centre

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Jane Percy – Potato Gene Resources Technician
Trudy Dalton – Potato Breeding Technician
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Cynthia Murray – Potato Breeding Technician
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